

## Editorial: The Status of LCA in the USA

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Life Cycle Assessment (LCA) is alive and well in the USA. The "birthing" process (or perhaps more accurately, the "re-birthing" process) in late 1989 was an easy delivery, with Clean Production and Pollution Prevention as supportive mid-wives. It seems clear that without the strong presence of these popular, green drivers, LCA would not have survived for long. Without these higher concerns for environmental management over strict command and control approaches, LCA may have stayed in the background as it did after its initial appearance in the 1970's (see Hunt and Franklin's article on LCA – How It Came About, *Int. J. LCA* [1]).

In addition, the very reasonableness of the life cycle concept in thinking about the entire spectrum of the environment is very appealing and hard to argue against. This, along with the imminent standardization of LCA through ISO 14000 on Environmental Management, helps the interest in LCA to spread as people strive to learn more about the concept and how to do an assessment. But whether this interest translates into activity is another matter. Through an informal survey of the open literature, combined with my observations and discussions with people in LCA meetings across the country, the following is my perception of the status of LCA in the USA.

It is difficult to truly judge the level of LCA activity that is occurring in the US. Often semantics makes getting to a true understanding of application difficult in that the term "life-cycle" is not used consistently when referring to environmental approaches. In a "pure" sense, LCA is defined as a cradle-to-grave environmental assessment that accounts for all resource use and releases related to the system being studied, and translates this information to the possible harm (or benefit) to the environment and human health. However, it is not unusual to find individuals who claim to be doing LCA but view a product's life cycle from the point of manufacture on downstream to disposal (in fact, I have encountered people who place their boundaries for inputs and outputs around their facility, gate-to-gate, and believe it to be an LCA). If asked, these individuals would respond that they do indeed use LCA. Others focus on a single component of concern (for example, greenhouse gases) and call the assessment LCA. These misconceptions of the LCA methodology that is being developed lead to a lot of confusion about who is doing what. However, in weeding through the different uses of the term "life cycle," one sees an increasing level of interest in LCA (i.e. the full term) in the United States.

Around 1990, interest in LCA was renewed in the US and activity quickly expanded as people learned of this new way to view environmental issues. Then around 1994, this activity leveled off. I attribute this slow down to two reasons, both to the appearance of the ISO 14000 Environmental Management System standard series. First, industry may be taking a wait-and-see approach to determine what the standard will require them to do (although it is a voluntary standard) before spending any resources and risking doing something that may be wrong. Second, and just as important, the relatively small community of individuals who had been actively engaged in methodology development became involved in the very time-consuming efforts of standards development. This resulted in their having less time to explore LCA and advance the methodology.

ISO 14000 has been both a help as well as a hindrance to LCA advancement. Its existence has been very instrumental in increasing the awareness of the life cycle concept within the environmental community. The development of the documents on LCA (14040 on General Principles, 14041 on Inventory, published the end of 1998, and 14042 on Impact Assessment and 14043 on Interpretation, both in draft (DIS) stage) have been very helpful in pulling the current thinking of LCA methodology together and making it available to the general public. ISO 14000 is a step in the right direction but there still remains a need to clarify terms and provide good methodology and data, based on the goal of the study.

In 1996, Bob Hunt reported that of the approximately 200 LCA's, or more accurately Resource and Environmental Profile Analyses (REPA's), that Franklin Associates has conducted over the years, only a very small number have been presented publicly. I believe that ratio still holds true today. Of approximately twenty articles in the two leading journals that carry LCA information (the *International Journal of LCA* and *Industrial Ecology*), only a half dozen (by my quick count) are of US origin, with half of these being funded by the federal government, including the Department of Energy (DOE), the Department of Defense (DOD), and the Environmental Protection Agency (EPA).

Many companies either continue or are starting to use the LCA concept for internal checks on their performance but are cautious to use the results in a public forum. This caution may also be attributable to the upcoming ISO 14042 document on Life Cycle Impact Assessment that places rigorous reporting requirements on the use of LCA results in a "comparative assertion" (i.e. an LCA that is used to make a market claim that one product is better overall for the environment).

Within industry, interest in LCA is driven by the larger, usually multi-national, companies. Notably, Procter & Gamble's efforts to apply LCA to their products to identify areas for environmental improvement significantly helped to raise awareness of LCA. They work closely with their suppliers in order to ensure a continuous supply of preferred materials, e.g. recycled packaging. Because of P&G's attempts to establish closer relationships with suppliers, the suppliers, in turn, are more open to P&G's needs [2].

For the most part, US companies that are applying LCA stay at the inventory level of methodology and focus on quantifying the inputs and outputs of the life cycle. In this way, the practice is still basically at the "less is best" level. While some companies have attempted life cycle impact assessment, the tendency has been to avoid using any formal approach to impact assessment, putting the practice about 4 or 5 years behind European practice.

Udo de Haes and Joliet (1999) point out the difference between US and European views as different perspectives on the use of LCA [3]. The following is their summary of views expressed at ISO 14000 meetings:

1. Forwarded by the US delegation, with support from some European countries, Japan and some developing countries, that LCA must be fully based on natural science; the results

must be reproducible, independent for the agent who performs the study.

2. The majority of European delegates regard LCA as a supporting tool for decision-making. Normative elements are not a problem as long as good procedure is followed with a clearly defined input from stakeholders, and as long as the results are presented in a transparent way.

In general, there is a feeling of frustration in US industry which wants to do LCA but is looking for the definitive, one-size-fits-all approach to do it. Further, there is still the underlying belief that an LCA can be used to get any answer the study sponsor wants. Because there doesn't seem to be a single tool that can be applied and give reproducible results regardless of who does the study, many remain skeptical about the usefulness of LCA.

Added to this, the US is very regulatory driven, leaving few companies able to see the need or benefit of going "beyond regulatory compliance." Often for smaller companies it is not so much a matter of need but of necessity where resources are limited and they must use what they have to comply with existing regulations. Other larger companies, however, are seeing the possible benefits of looking holistically at their operations. To them LCA is a way to be proactive in environmental management by heading off potential problems, as well as benefiting from an improved corporate image.

It seems that adoption of the life cycle concept within the federal government is lagging behind industry. This may not seem to be the case to those who are familiar with the applications of life cycle costing (LCC) in the Departments of Defense and Energy. However, there is confusion about terms that include the words life cycle, such as LCC and Life Cycle Management (LCM). LCC has been mostly used by DOE to evaluate energy alternatives, and by DOD to examine full life-cycle costs of procuring and maintaining new weapon systems. LCM is similar to LCC but is used more by private industry, e.g. Chrysler Corporation, to evaluate the total ownership costs (i.e. the costs to the manufacturer) associated with proposed changes for environmental improvement. While such efforts could include such things as societal costs, these considerations are often not included in LCC and LCM. While LCA focuses in creating an understanding of the total environmental consequences, not in monetary terms, of a product system. This is not to say that LCA is "better." LCC, LCM and LCA are different tools which decision-makers can choose from to get pertinent information (cf [4]).

Other tools are being proposed which use the life cycle concept by looking across the life cycle stages of a product or process system, but in shortened versions. For example, an abridged LCA approach was developed by AT&T, and used by others in industry, such as Motorola. However, there is the potential that some attempts to shorten the LCA approach result in looking at each life cycle stage individually and lose the ability to identify environmental trade-off's between stages.

For example, in looking at the waste management stage of a consumer product, solid waste is identified as an area for improvement, such as increasing recycling. But this single-issue focus does not take into account the additional energy and potential environmental impacts that result from recycling operations through transportation and reprocessing. It seems that often environmental activities, such as Design for the Environment and Pollution Prevention, are based on a type of life-cycle "thinking" but are void of consideration of a trade-off analysis.

Regarding the EPA, this Agency which is structured by air, water, and waste concerns, continues for the most part to follow these

lines of responsibility and maintain a single-issue focus. However, the life cycle concept is slowly being introduced in policy discussions, and the Office of Research and Development continues to support a strong LCA research program. The primary interest is in assisting in the development of guidelines and databases for use in the public and private sectors. The EPA inventory guidance document published in 1993 has been followed by other documents furthering the methodology and showing applications. The US DOE and DOD have worked with EPA in developing LCA tools and data.

As a result of Executive Order 13101 on "Greening Government" EPA has established five guiding principles on environmental preferability of products (available at [www.epa.gov/opptintr.epp](http://www.epa.gov/opptintr.epp)). Although the guidance does not call out a full life cycle assessment as the way to evaluate the preferability of products, EPA's Systems Analysis Branch is currently preparing guidance on the use of life cycle assessment for exactly that end. The new guidance will outline how a life cycle assessment should be performed to show environmental preferability, through a new tool called FRED (Framework for Responsible Environmental Decision-making). By setting many of the parameters of a life cycle assessment, FRED simplifies data collection and provides a more uniform format. This better supports comparisons of disparate products.

The split between the scientists and engineers who are trying to develop a scientifically-defensible tool and the business managers and policy makers who are trying to make sound environmental decisions is seen clearly within the environmental community in the US. Recently, a SETAC - North America workgroup on environmental decision-making tools and techniques started an effort with the goal of integrating the myriad of decision-support tools and techniques that are available to support decision-making. Initial discussions with decision-makers found that they are not interested in having tools, but instead want the information they need to help them make a decision. The result is the growing realization that the life cycle concept has grown beyond being simply a tool to compare products but is now seen as an essential part of achieving broader goals such as sustainability.

In order to get there, the US needs to continue to develop its expertise and allow for LCA researchers and practitioners to come together to share ideas and data in order to reduce the cost of conducting LCA. This will require the continued cooperation between industry, government and academia.

Cooperation is also important at the international level. In my many years working in the US government and in the environmental field, I have not been involved in an area where international consensus carried such importance. LCA seems to be very unique in this respect. Its very nature of looking at the interconnectedness of product systems that do not stop at geographical boundaries requires this. It is important that we continue the development of LCA methodology at the international level.

## References

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